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Citation style: Szymanek Krzysztof, Zielonka Piotr. (2017). Behavioural Economics in the Context of Social Science Methodology. "Journal of Management and Business Administration. Central Europe" (Vol. 25, No. 4 (2017), p. 177–192), doi 10.7206/jmba.ce.2450-7814.213

„Journal of Management and Business Administration. Central Europe"
Vol. 25, No. 4/2017, p. 177–192, ISSN 2450-7814; e-ISSN 2450-8829

Behavioural Economics in the Context of Social Science Methodology

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Submitted: 25.10.17. Final acceptance: 8.12.17

Abstract

Purpose: The article discusses selected methodological issues of natural and social sciences with particular consideration of behavioural economics to highlight the significance of experimental research.

Design approach: The order of the issues covered is as follows: (a) science as a product of a research community, (b) basic cognitive activities in science, (c) a short description of social sciences, (d) a discussion on the methods applied in behavioural economics.

Findings: The article offers a description of research procedure, its objectives and the methods applied therein; it has been stressed that testing theories and hypotheses involves exposing them to falsification; it has been emphasised that research conducted within the framework of social sciences is more difficult than in the case of natural sciences because of the large number of independent variables and the possible interaction between the researcher and research participants.

Practical implications: The content presented in the article highlights the value of scientific findings as opposed to common-sense knowledge adopted with the disregard of the principles of proper methodology.

Value: The authors believe that the emergence of behavioural economics was an attempt to overcome certain deficiencies in the methodology of classical economics by means of experimental research.

Keywords: natural science, social science, methodology, behavioural economics, falsification

JEL: B49

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English-language translation and editing of that article was financed under Agreement 763/ P-DUN /2016 with funds from the Ministry of Science and Higher Education allocated to the popularization of science.

 DOI: 10.7206/jmba.ce.2450-7814.213

Introduction

Issues related to progress in science and conducting scientific research tend to be surrounded by controversy. We would like to use this paper to briefly discuss selected methodological issues from the social sciences in relation to the relatively fresh discipline of behavioural economics. It is based on different paradigms than classical economics, e.g. it allows for deviations from the rationality of market participants and for drivers other than profit maximisation (Morawski, 2016). Still, the dissimilarity of paradigms is not the topic of this paper. We rather intended to focus on the research procedure, on the objectives and methods applied therein, and to refer at the same time to the fundamental principles of research practice. We will try to cover the methodological imperfections of social sciences which have contributed to the appearance of the behavioural approach, as it is quite important to note that behavioural economics is not the only behaviour-oriented approach in social sciences. Recent years have seen the emergence of such disciplines as behavioural law, behavioural ethics, behavioural finance, and behavioural management. At this point, it is necessary to mention the emergence of a new paradigm in economics, combining the descriptive and normative approach (Kołodko, 2017). To begin with, it seems reasonable to recall the standards of research procedures applied in science, which will make it possible to present the issues which are of interest to us in a clear manner.

Explanations of reality as offered by science have been changing the way people think about themselves and the world for many years now. Whenever we talk about a scientific understanding of reality, it does not pertain to any kind of enlightenment, any contemplative state combined with extraordinary experiences or the transformation of consciousness. A scientist's vision of the world is objective and verifiable. Scientific understanding is commonly available, open to the public, and able to be tested and verified by anyone 'equipped with' the right competence. A scientist does their best to let other researchers become familiar with their line of thought and research results, compare them with their own findings, and eventually approve or criticise them. This applies to all outcomes of scientific activity – every idea aspiring to become accepted as a truth is thoroughly and critically investigated and examined by research communities. In the case of science, there is no possibility of substantiating propositions by referring to the opinions of respectable people, to ancient records, or to time-honoured commonly professed beliefs. The development of science is about a constant clash of views, a battle of ideas, whose outcome leads to the survival of only the fittest, the ones that are best proven and compliant with the highest standards. In the world of science, no proposition is considered eternal. Every claim may be undermined in the future; the process of verification never ends. There is a permanent analysis of and search for loopholes in already accepted theories, key experiments are replicated, and earlier perspectives, inaccuracies, and gaps in reasoning are challenged. The sustained development of scientific knowledge leads to situations where it is sometimes necessary to thoroughly revise old views that were once regarded as unquestionable and final. They need to be adapted to new standards, or substituted with new ones. Carl Sagan (1934–1996), an astronomer and science populariser, perceived science as a self-correcting process. Paradoxically, this constant unrest, this scepticism, this ceaseless clash of ideas and the freedom to criticise do not lead to anarchy or chaos, but rather act as the driving force behind progress in science. Fields aspiring to become bodies of knowledge but devoid of the abovementioned element of dispute and absolute criticism do not develop, but remain stagnant (Szymanek and Zielonka, 2017).

Individual views that have not been scientifically verified, but are based only on an individual's access to limited knowledge and supported by irregular, common observation do not deserve to be trusted as much as science is. The effects of building knowledge based on non-systematic observation was perhaps best exemplified in the past by medicine, where it was not until the 20th century that a methodologically correct verification of therapy techniques was applied. Medical knowledge was based not on the results of experiments and observation, but on the experience of individual physicians. The effects of the situation proved disastrous. L.J. Henderson, a biochemist from Harvard University, claimed that not until 1910 did the average ill person seeing a randomly selected doctor have a more than 50% chance to benefit from their appointment (Szczeklik, 2002). The reason for this was not physicians' limited intellectual capacity, poor perceptiveness, or lack of care, but a lack of methodological awareness, which made researchers draw completely ungrounded conclusions. The automatic psychological inclinations emerging and governing people's judgments in such methodological obscurity made it impossible to reason correctly, rendering those judgments tendentious and insensitive to signals of potential erroneousness. Falling into the confirmation bias trap was very common because people are driven by an impulse to search for and remember only the data that proves their own hypotheses, at the same time failing to notice, forgetting, or ignoring any inconvenient cases. If someone who disregards methodological standards tests a hypothesis regarding the effectiveness of a drug while driven by such impulses, they will be willing to consider all cases of recovery from a disease after the application of said drug as evidence to support their hypothesis, and regard and mentally record all instances of failure in treatment using the drug as exceptions. It is important to stress that even if the majority of patients recover from illness after they are prescribed a given drug, this will still not prove the effectiveness of the drug. Many diseases subside spontaneously, by themselves. It is therefore possible that patients may recover *regardless of* having taken the drug. If

 DOI: 10.7206/jmba.ce.2450-7814.213

there is no control group, we may not know how many patients would have recovered without taking the drug. Conducting studies on a random experimental group and a control group of appropriate number of subjects determined on the basis of statistics is a precondition for assessing the effectiveness of any therapy. A rigorous research regime also involves the application of the double-blind standard: no patients know which group they belong to, nor do any researchers know it when evaluating each patient's condition (Szymanek and Zielonka, 2017).

Laws in science

The laws applied in psychology or medicine differ from those functioning in natural sciences such as classical physics, to give but one example. The latter are of deterministic nature, which means that according to such laws, whenever certain conditions occur, a certain phenomenon has to take place as well. In the case of some medical sciences, psychology, or economics, probabilistic laws (or rather regularities) are usually identified, according to which the occurrence of certain conditions does not make a phenomenon bound to happen, but only likely to do so. Such likelihood, or probability, is often given in figures (e.g.: "fever occurs in 60% of cases of disease x"), but the laws in use frequently tend to imply only that a given effect occurs more often in the experimental group than in the control group. Both the identification and utilisation of probabilistic laws in research practice are challenging and may be the source of errors. Probabilistic laws manifest themselves not in one-off cases, but in groups. Finding that an effect occurs in a certain situation may not be considered either a proof of or a contradiction to a probabilistic law. This is a mistake referred to as small sample error, also known as: "I know a person who..." The latter comes from the common but incorrect attempts which people make to deny probabilistic laws. For instance, when a smoking addict hears of the scientifically proven harmfulness of smoking to human health, they respond: "OK, but I know a person who smokes two packs of cigarettes a day and is in great shape, and this year marks their ninety-fifth birthday." To form an opinion about certain probabilistic regularity, it is necessary to look into a number of cases. Fallacious understanding of probabilistic laws is also related to a very common mistake known as *post hoc ergo propter hoc* ("after this, therefore because of this"), which implies that A is the cause of B when B occurs after the occurrence of A (Szymanek and Zielonka, 2017).

Formal sciences

An important difference between sciences lies in the method of substantiating propositions. In the case of formal sciences, also referred to as a priori sciences, such as formal logic and mathematics, a researcher may substantiate a new proposition without leaving their chair, or even without opening their eyes after waking up. Substantiation involves deriving a proposition through appropriate transformations within a system of axiomatic propositions called axioms, which is about finding a proof to support this proposition. A proposition, once proven, remains proven for ever and will never be undermined by anyone. However, formal science propositions do not concern empirical reality nor say anything about it. They refer to abstract ideas which cannot be experienced through the senses, such as numbers, geometric figures, or vector spaces. No observation or experiment may either deny or prove any mathematically proven truth. These areas, speaking in general terms, provide tools to process information, construct notions useful for analysing reality (e.g. number, square, function), and identify the relations they are subject to, which makes it possible to draw precise and objective conclusions. Whenever it is possible to express some data in mathematical terms, mathematics and logic will help to extract information out of it. It is possible to determine what can and what cannot be inferred from such data with absolute accuracy. Yet mathematics "doesn't know" what the researcher wants to present using numbers or geometric figures and what their objective is. Its view encompasses only the abstract content of these notions. Mathematical models are governed by absolute, precise and strict rules, and the responsibility for their correct adaptation to the analysed reality rests with researchers (Shapiro, 1997).

Empirical sciences

Unlike in the case of formal sciences, empirical sciences describe reality that can be experienced through the senses, and do not offer any truths proven once and for all. Propositions are substantiated only to a certain extent, and even those substantiated best may turn out to be erroneous in the future. Researchers are condemned to much guesswork when searching for regularities and laws governing reality. Contrary to popular belief, facts do not speak for themselves: scientific theories cannot be interpreted based on data collected or deduced in an objective manner from accumulated knowledge. Any set of facts contains numerous different regularities that cannot be reconciled with one another, and there is no method that would make it possible to determine *a priori* which of these regularities actually governs our reality and works for newly emerging data. The only thing a researcher can do is to use their knowledge

 DOI: 10.7206/jmba.ce.2450-7814.213

and experience to try to guess the truth and then confront it with reality (Quine and Ullian, 1978; Chalmers, 2004). This procedure is called putting forward hypotheses, followed by testing them. A researcher tries to make the proposed hypothesis coherent with known facts so that it does not lead to conclusions opposing the accumulated observations, and it is possible to conclude as many known facts as possible on such a basis. A hypothesis should offer correct predictions that are unknown at the time it is proposed. Therefore, a hypothesis exists because of its consequences, and its entire value comes down to what can be inferred from it.

The basic method of testing hypotheses is about checking the correctness of conclusions drawn from them. A typical scientific hypothesis concerns an infinite number of events and refers to issues that are not directly observable (Skyrms, 2000; Quine and Ullian, 1970). It is never possible to exhaust all cases, and the verification procedure is never final. There are never sufficient grounds to claim that a hypothesis has been proven conclusively. But passing a certain number of tests successfully induces researcher communities to regard a given hypothesis as sufficiently proven to consider it an element of scientific knowledge (Nola and Sankey, 2007).

However, it is not only the number of tests that counts, but also their strictness. The stricter the tests a given hypothesis is subject to, the better proven this hypothesis is. The more likely it is that a given test exposes the falseness of a hypothesis if it is actually false, the stricter such a test is considered. For instance, the more precise the measurement instrumentation in use, the stricter the test. Sensitive tools will detect even a slight deviation from prediction, so if no such deviation has been discovered, the better it is for the tested hypothesis. It quite often happens that according to current knowledge, conditions X should trigger *q*, but the tested hypothesis proves it wrong – because it shows that what follows is the occurrence of *r*. So when it turns out that *r* instead of *q* occurs in conditions X, we can say that the hypothesis has been subject to strict tests, and the stronger the grounds to think that *q* would occur in conditions X, the stricter the test appears to be (Popper, 1959).

Falsification

If researchers across the globe came across only white swans, they should not simply assume that all swans are definitely white. Even if they encountered millions of white – and only white – swans, it would not be conclusive proof to support the hypothesis that all swans are white, but would only mean that there are no reasons to reject a hypothesis that all swans are white. Once the first non-white (e.g. black) swan is spotted, the hypothesis becomes refuted. Therefore, until a hypothesis is disproved, it may be treated as true (Zielonka, 2003).

It is pointless to test hypotheses for which it is impossible to design a test that could – even theoretically – lead to considering a given hypotheses false, i.e. hypothesis falsification (Popper, 1959). A non-falsifiable hypothesis may be reconciled with any state of affairs, which makes it highly uninformative with regard to reality. An example may be an astrological prediction: “It is possible that you’ll have a meeting with a Pisces next week”. Whatever happens next week, whether there is a meeting with a Pisces or not, the prediction will certainly not be proven wrong. It is impossible to find a state of affairs that – if it came true – would render the prediction false. To compare, a falsifiable hypothesis is “All ravens are black”. The sentence may be considered false after we come across a green raven. Falsifiability is a gradable quality, and can be limited to a smaller or larger extent by the way in which a hypothesis is formulated. Sometimes hypotheses are formulated in too general a manner, or unclearly, depending on the implicit conditions accepted in silence. It is then difficult to investigate which observation or potentially true fact could contradict the formulated hypothesis. Which fact could stand in opposition to the following hypothesis: “The market will achieve balance sooner or later”. If the market achieves balance after a year, the hypothesis will turn out to be accurate. If not, it will be impossible to consider it false – after all, it argues that balance will occur “sooner or later” – not necessarily after a year.

Of course, there are even greater research difficulties with probabilistic hypotheses such as: “In conditions X *r* will occur at a probability rate of p”. For instance: “When X occurs, in the majority of cases *r* occurs as well”. In such situations, a one-off observation of the occurrence or absence of *r* in conditions X has no value as a hypothesis test. In the case of a probabilistic hypothesis, testing requires making a number of repeated observations.

It is therefore crucial to clearly determine what does and does not result from a given hypothesis when it is tested. This is where a significant difference between the natural and social sciences appears. Thanks to the concrete form of notions used in social sciences and to the wide-ranging application of mathematics, we are able to draw very precise and clear conclusions from the analysed hypotheses. Drawing such a conclusion often involves replacing numbers in a given formula. In the case of social sciences, the situation is much more difficult. Here, deciding if a given conclusion does or does not result from the presented hypothesis may be infected with subjectivity. If there are different views on what stems from the analysed hypothesis, there appears a serious difficulty in testing it.

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Theories

When we say that something stems from a hypothesis, it is usually about a conclusion drawn on the basis of the hypothesis and some additional statements that have previously been considered true. Hypotheses in science appear in the context of a broader ordered set of propositions and ideas, definitions, postulates, and models related thereto, referred to collectively as a theory. The most important propositions of theories are those that express the laws governing the analysed reality. Building a theory is a fundamental cognitive activity in science, aimed at organising a chaotic reality through the notional isolation of the most important elements thereof and by indicating the relationships occurring among them. Theories differ to a great extent in terms of their scope, degree of coverage, coherence, precision of formulation, and methodological advancement (Suppe, 1977). They are extended hypotheses, subject to testing in the aforementioned manner. In the case of natural sciences, a scientific theory is a system of propositions providing explanations and predictions, generating empirically testable hypotheses. As an example, Democritus' views connected with the idea of the atomic structure of matter were not a scientific theory. It is impossible to use these views to derive any hypotheses that would concern observable facts. It was a purely speculative concept, unlike John Dalton's atomic theory that appeared thousands of years later and offered precise quantitative empirical predictions. The term of *theory* is sometimes used in a different sense in the case of social sciences. It is referred to, for example, in deliberations about the history of various ideas, in very general analyses, or in speculative discussions about certain concepts.

Different theories often pertain to the same area of reality, but it might still be impracticable to reconcile them. This is where the problem of the selection of the best theory appears, which becomes a challenge because there are many different criteria to check the quality of theories, which results in a situation where it is generally impossible to choose the best one using objective tools. Theories are expected to be falsifiable, simple, precise, general, and coherent with both the remainder of the knowledge possessed and with related theories (Kuhn, 1977). A single theory may be superior to another in certain terms, but at the same time inferior in other terms. Theories usually tend to develop, which causes their original characteristics to change: certain flaws are eliminated, but there are others that may take their place. Frequently, despite some evident drawbacks of a theory, a group of researchers may regard it as promising and devote their time and effort to explore it. Copernican heliocentric theory was originally clear in its opposition to physical and astronomical theories of the time, and Ptolemy's competing theory was consistent with them. Both theories were similarly complex and did not differ much in terms of accuracy. But the qualities of Copernicus' theory caused several remarkable scientists of the time to support it. Their work helped remove the theory's flaws step by step, and new discoveries in physics and astronomy showed that certain flaws actually only seemed to be so. After Kepler's concept of elliptical orbits was introduced, the heliocentric theory became incomparably simpler and more accurate than the competing theory. Years of development proved that it outclassed the geocentric theory in all possible aspects (Kuhn, 1985). Such an unqualified victory of one theory over another is a phenomenon typical of natural sciences, yet is much rarer in the case of social sciences, where it is normal to see two or more theories concerning the same aspects of reality coexist.

Explanation

Although collecting objective data in scientific research is crucial, obtaining even the most extensive knowledge of a topic does not create science. Alchemists previously possess a vast body of information about chemical substances, but their knowledge certainly did not deserve to be called science. Science is required to offer much more than just a description of reality. Scientific theories exist to condense complex knowledge into simple, precise, and clearly formulated laws that govern the world in which we live. A scientific understanding of reality is manifested in building theories which are able to explain and foresee various phenomena. Explaining is, essentially, providing answers to the question of "why?" This question appears when it is known that a given phenomenon has occurred, but what has caused it, what other phenomena have contributed to its occurrence, and why it has followed the course it has remains unknown (Ruben, 2004). The most perfect method of explanation in science involves presenting a phenomenon as a set of certain fixed relationships expressed in sentences such as: *Whenever X, then also Y*. According to this theory, the laws included therein *must have* led to the effects observed in certain circumstances. If the question is "why did Z occur?", the answer is: "because in conditions X, which did occur, laws P_1,..., P_n say that Z has to occur as well". The question of: "Why does the water in the observed glass boil?" can be answered as follows: "The water boils because the air pressure is normal, the water temperature is 100 °C, and the law says that whenever the air pressure is normal and the water temperature is 100 °C, water boils". Explanation therefore involves indicating the general regularities, which are laws included in a given theory. But not every regularity may be called a law. Let us assume that it has been established that none of hundreds of thousands of Warsaw University graduates has ever come down with the plague. But if the question of: "Why has Jan never come down with the plague?" is answered as follows: "Because he graduated from Warsaw University, and no Warsaw University graduate has ever come down with the plague", it may not

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be considered a convincing explanation. It seems unlikely that the indicated regularity affects these statistics. It seems that the absence of cases of the plague among Warsaw University graduates is rather a lucky coincidence, and thus not eligible to be called a law. A scientific explanation requires that the indicated regularities be *laws of science*. A scientific law, like a national law, prohibits certain states of affairs and excludes the possibility of their occurrence in the past and in the future. Meanwhile, notwithstanding the fact that not a single Warsaw University graduate has come down with the plague, although they *could have* come down with it, graduating from Warsaw University has not improved their resistance to this disease. It seems particularly unlikely that the people who did go down with the plague would not have come down with the disease *if* they had graduated from Warsaw University. The scientific law regarding the boiling of water says that it is not possible that a sample of water does not boil in certain specific conditions. Every water sample would boil *if* these conditions occurred.

Unfortunately, scientific laws in the strict sense are encountered only in natural sciences. No such strict scientific laws are formulated in social sciences, which are content with discovering empirical generalisations of causal nature. In the case of social sciences, explanation involves usually an indication of the reason for a given phenomenon. The question of: "Why did phenomenon Z occur?" is answered as follows: "Phenomenon Z was triggered by causes p_1, p_2,...p_n". When formulating an explanation of such type, there is no indication of conditions that always lead to a certain effect according to some law. What are indicated, however, are the causes that have led to the occurrence of the phenomenon in certain pre-existent conditions. In the case of social sciences, we usually deal with phenomena triggered not by one specific cause, but rather by a larger number of causes, with each such cause having an impact on the occurrence of a given phenomenon. Theories cover only part of the significant causes. Arriving at a set of causes explaining 50% of variability of the explained phenomenon is considered a success. But it may turn out that these causes are independent of one another.

Theories that can explain any possible phenomenon are of no cognitive value. In the 19th century, there was a common view that human behaviour could be explained by instincts that drive humans – and many such instincts were listed (Hergenhahn and Henley, 2017). If somebody looks for company, they must be clearly driven by the socialistic instinct. But opting for solitude may be explained by the individualistic instinct. A theory of this type is able to explain any kind of human behaviour, which makes it cognitively void. Similar reservations have been voiced about psychoanalysis: "Can you think of a dream that a psychoanalyst would consider impossible to be had?"

Mario Bunge (1996) wrote a radical essay where he included a quite long list of pseudo-scientific areas of knowledge, devoid of the possibility of falsifying hypotheses, but still present at many universities. Among those areas was pseudo-mathematical symbolism using social notions to resemble formulas involving physical quantities, e.g.: social frustration /mobility = participation in political life.

Forecasting

Forecasting is common to all fields of science. Even palaeontologists seem to try to predict the excavations they may find. Familiarity with scientific laws and with the principles of cause and effect makes it possible not only to explain, but also to predict phenomena, which means the ability to answer questions like: "What will happen in conditions XX?" or "What conditions need to be created to cause Y"? While the ability of a theory to explain phenomena offers a sense of understanding reality, the ability to predict phenomena grants practical advantages that make it possible to achieve the desired goals and avoid undesirable events. Forecasting – unlike explaining – may also be based on regularities that are not of causal nature. Correlative relationships will suffice to this end. It is possible to predict the future achievements of students based on their entrance examination results, although there is no cause and effect relationship between the two.

Forecasts offered by natural sciences are much more valuable than those provided by social sciences. The reason behind this lies in the very subject of research conducted in these two types of sciences. In the case of natural sciences, studies explore systems of a relatively low level of complexity, composed of a small number of components, featuring a small quantity of factors of impact. Newton's theorem describing the Solar System considers only the force of gravity acting between celestial objects and utilises the law of universal gravitation to make it possible to formulate accurate predictions for the forthcoming thousands of years. It is difficult to imagine such a situation in the case of social sciences, where the researcher needs to take into account the existence of hundreds of simultaneously occurring variables, additionally involved in complex interaction with one another. With natural sciences, in turn, even if there are some complex systems, it is possible to concentrate – at least at the first approximation – on only a few of the most crucial elements, which always makes an issue easier to manage. Besides, complex systems are usually relatively easy to 'decompose' into simpler subsystems that can be examined in isolation from each other. The Solar System is composed of thousands of elements, but Newton was able to limit his studies to only a few of them – namely the Sun and the planets – with a fruitful outcome, as

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it turned out. Moreover, the possibility of analysing the movement of each planet around the Sun separately and with a reasonable degree of accuracy, ignoring the interaction with other planets, became evident. It is unfeasible to reduce hundreds of thousands of businesses to the several most important ones and to analyse the relationships between them in separate pairs. There is also the instrumentalist approach, supported by Milton Friedman among others, who claimed that scientific theories cannot be tested by testing the realism of their assumptions, and all that matters is the accuracy of a theory's predictions, not whether or not its assumptions are true (Rzeszutek and Szyszka, 2017).

According to a well-known myth, when Oedipus' father heard a prophecy that he would be killed by his new-born son, he abandoned the child, triggering a series of events that concluded with his death at the hands of Oedipus. Self-fulfilling prophecies such as the "Oedipus effect" are a phenomenon absent from natural sciences. The term was coined by Robert Merton (1948), who first used it in an article entitled "The Self Fulfilling Prophecy". The very fact of announcing a prediction may lead to its fulfilment, or by contrast, to its non-fulfilment because of the fact that society will make its decisions whilst taking the prediction into consideration. Spreading false news of a situation where a bank is reputedly insolvent may cause the bank's clients to withdraw their money from the bank, which may lead to the actual bankruptcy of this bank. Generally speaking, the outcome of scientific research on society has an impact on the society itself. It should be quite obvious that the influence of this phenomenon on the accuracy of predictions in social sciences is destructive. Karl Popper (1957) claimed that it is impossible to predict the future of societies using scientific methods. The course of history is unpredictable because of purely logical reasons. Even if someone developed a calendar of social life, it would lead to events or actions that might thwart the predictions included therein. Let's assume that one day, the calendar announces a three-day increase in stock prices followed by a precipitous drop in these prices. Stockholders would try to sell their stocks on the third day at the latest, causing an earlier slump, which would lead to the invalidation of said forecast.

Experiment

Natural sciences offer an opportunity to conduct repetitive and universal experiments that make it possible to trigger the same phenomenon in convenient conditions a number of times, and to manipulate only one factor while controlling other ones, which allows one to draw reliable conclusions. In the case of social sciences, the possibility of conducting experiments is limited. Research is usually based on observation that makes it impossible to isolate single factors in controlled conditions. No experiment can be repeated in identical conditions; and no research result obtained in an experiment may therefore depend on factors beyond the experimenter's control. When other researchers fail to replicate an experiment, it is unknown whether the reason is the lack of a real relationship between variables, or the occurrence of a factor missing from the original experiment.

Although the behavioural approach to social sciences involves the application of experiments as a research method, there are additional interpretational difficulties absent from natural sciences, such as the external validity of research. Here is an example of a behavioural economics experiment called the *ultimatum game* (Carter, 1991). There are two people taking part in the experiment: A and B. The moderator gives \$100 to person A. Next, person A is asked to offer any part of the received amount to person B. If person B accepts the amount obtained from A, both people will be able to keep their respective amounts. But if person B rejects A's offer, both people lose all the money to be received. Assuming that each of the entities involved maximises utility, cooperation between person A and person B would proceed as follows: Person A offers any amount from a left-open interval (\$0;\$100>. Person B accepts any of these amounts. If, for instance, person A offers \$10, it would be reasonable for person B to accept the offer because the utility of \$10 is greater than the utility of zero dollars. In reality, not many people in A's place offered B an amount as low as \$10. And even if such an offer eventuated, it was usually rejected by B as too low. To the majority of research subjects, there was another factor that appeared to be more important than profit maximisation. This factor was a sense of justice. Person A did not offer extremely low amounts to person B because of the awareness that person B would not regard such amounts as fair or just. If person B rejects the offer, both people lose everything. It turned out that person A offered amounts close to \$50.

Even though the *ultimatum game* experiment has made it possible to determine human behaviour in artificial conditions, an important question a researcher needs to ask themselves is about the external validity of the experiment, i.e. to what extent the discovered regularities can be generalised with regard to real human behaviour in natural conditions. The case is similar to hypothetical choices made by participants in experiments. Can the results of such experiments be generalised with regard to decisions actually made in business and in everyday life?

In natural sciences, the course of a phenomenon is usually determined by only a few variables, taken into account by theory as well. In the case of social sciences, theories consider only part of the variables of significance to a given phenomenon. It is impos-

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sible to take all variables into consideration because of the number of them and the fact that many significant variables are simply unknown. The regularities identified by social sciences are most often only probabilistic for this very reason. The behaviour of phenomena described by a given theory depends not only on the factors taken into account by this theory, but on other factors outside of its range as well.

Furthermore, in light of people's sensitivity to information which they receive and which may influence their opinions and, as a consequence, their decisions, creating a theory that would make accurate forecasts possible seems rather unlikely. An example of human sensitivity to received information is the case of the increase in the price of stocks of Dayang Trands, a Chinese clothing company. The price of their shares rose by 100% within less than a fortnight after a famous American investor, Warren Buffett, said in public that he wore suits made by the company. Oskar Morgenstern, the co-creator of the expected utility theorem, did not believe that economics could be used in forecasting economic events. Consumers, managers, and politicians take such forecasts into consideration and change their actions and decisions on that basis. This forces forecasters to modify their predictions, which, in turn, forces the audience of these predictions to react. According to Morgenstern, statistical methods in economics are virtually useless unless used for descriptive purposes (Bernstein, 1997).

Discussion

Using experimentation as the basic research method in behavioural economics offers a number of advantages. It helps overcome many methodological deficiencies which curb the development of social sciences, such as the limited ability to detect causal relationships and the difficulties related to theory testing. The application of empirical research favours the formulation of testable hypotheses. The development of the descriptive side of economics is ongoing, providing more information on how people actually make their decisions and form opinions, and about the reasons behind them. The situation is similar in the case of other behavioural approaches to social sciences such as behavioural law, behavioural ethics, behavioural finance, or behavioural management. Furthermore, the recent past has seen noticeable development in terms of application domains (*nudge, behavioural design*), describing the application of discoveries from the behavioural social sciences in social and corporate policies. The popularity of the behavioural approach is increasing year-by-year. Daniel Kahneman and Amos Tversky's article (1979) entitled "Prospect theory: An analysis of decision under risk", being one of the first significant works from the behavioural economics, has been quoted over 47,000 times so far, which is one of the largest such results in social sciences. It seems that the dynamic development of behavioural economics, crowned with the Nobel Memorial Prize in Economic Sciences awarded to Richard Thaler in 2017, will contribute to an increasingly better level of cognition, understanding, and even forecasting of human economic behaviour.

However, the behavioural approach to economics does not solve all methodological problems in the social sciences. In fact, it actually generates new problems. For instance, limiting oneself to a description of only selected human behaviour makes behavioural models open to the charge of fragmentarism. Many economists do not treat the behavioural approach as a consistent, homogeneous scientific area, but rather as a set of loosely connected themes concentrated mainly on modifying the classical economic theories by confronting them with the findings of empirical research (Rzeszutek and Szyszka, 2017).

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